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| **Forces and Motion**  **PSc.1.1 Understand motion in terms of speed, velocity, acceleration, and momentum.** | | | |
| **Learning Targets (I can)** | **Criteria for Success (I will)** | **Mastery Level %** | **Date** |
| I can explain how frame of reference is important when discussing the speed or velocity of something. | * I will discuss how speed/velocity is relative to the point to which we compare it. (ex. sitting on plane) |  |  |
| I can identify distance and displacement as a scalar-vector pair. | * I will know the difference between distance and displacement. * I will interpret all motion as relative to a selected reference point. |  |  |
| I can compare velocity and speed using scalars and vectors. | * I will use vector and scalar drawings to show that velocity has a direction. * I will analyze vector/scalar drawings and use the equation v=d/t to find the velocity of an object. |  |  |
| I can mathematically determine the velocity of a moving object. | * I will solve word problems using the velocity equation v=d/t. |  |  |
| I can mathematically determine the rate of acceleration of an object. | * I will solve word problems using the acceleration equation a= Δv/t. |  |  |
| I can analyze a graph and use the information presented to determine the displacement, velocity, or acceleration  of an object. | * I will look at different graphs of data and determine the displacement, velocity, or acceleration of an object. * I can distinguish the difference between a distance/time graph and a velocity/time graph. |  |  |
| I can analyze and interpret graph trends relating to velocity and acceleration. | * I will look at different graphs and be able to explain what is happening to an object in terms of velocity and acceleration. |  |  |
| I can determine what momentum is and the factors that affect the momentum of an object. | * I will explain how momentum is affected if I change the mass or speed of an object. |  |  |
| I can explain the relationship between momentum and force. | * I will find everyday examples of how force and momentum are related (in sports, news, etc.). |  |  |
| I can properly identify and place the correct units for each variable in an equation | * I will understand the units of measure for acceleration and velocity. |  |  |
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| **Forces and Motion**  **PSc.1.2 Understand the relationship between forces and motion.** | | | |
| **Learning Targets (I can)** | **Criteria for Success (I will)** | **Mastery Level %** | **Date** |
| I can differentiate the difference between weight and mass. | * I will explain how weight and mass are different. |  |  |
| I can mathematically solve the weight of an object using Fg=mg. | * I will calculate the weights of different objects using the weight equation Fg=mg. |  |  |
| I can explain how with no air resistance the velocity of an object due to gravity is 9.8 m/s2. | * I will illustrate that an object accelerates at a constant rate of 9.8 m/s2 if there is no air resistance. * I will explain that gravity is a constant value regardless of the mass of an object. |  |  |
| I can explain that terminal velocity is the result of air resistance on an object in free fall. | * I will demonstrate how air resistance affects different objects in free fall. |  |  |
| I can explain that friction is a force that opposes motion of an object. | * I will illustrate how force can affect the motion of different objects. |  |  |
| I can demonstrate the different types of friction that may affect the motion of an object. | * I will demonstrate how static friction affects motion. * I will demonstrate how sliding friction affects motion. * I will demonstrate how rolling friction affects motion. * I will demonstrate how fluid friction affects motion (both in a liquid and in free fall). |  |  |
| I can explore the relationship between mass and inertia (Newton’s 1st Law). | * I will explore real world examples that demonstrate the relationship between mass and inertia (Newton’s 1st Law). |  |  |
| I can compare balanced and unbalanced forces both mathematically and graphically. | * I will mathematically solve problems showing balanced and unbalanced forces. * I will illustrate graphically balanced and unbalanced forces. |  |  |
| I can demonstrate and mathematically show the relationship between mass, force, and acceleration. (Newton’s 2nd Law) | * I will solve word problems with F=m x a. * I will demonstrate how change in mass and force will affect acceleration. |  |  |
| I can explain that forces always occur in pairs. (Newton’s 3rd law) | * I will be able to explain that for every action there is an equal and opposite reaction. * I will be able to apply real world examples to Newton’s 3rd Law. * I will be able to identify and illustrate the action and reaction forces. |  |  |
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| **Matter: Properties and Change**  **PSc.2.1 Understand types, properties, and structure of matter.** | | | |
| **Learning Targets (I can)** | **Criteria for Success (I will)** | **Mastery Level %** | **Date** |
| I can investigate and classify different samples of matter. | * I will examine a sample of matter and determine whether it is homogenous or heterogeneous. * I will examine a sample of matter and determine whether it is pure substance or a mixture. * I will examine a sample of matter and determine whether it’s a solution, colloid, or suspension. * I will identify the characteristics of a solution, colloid, or suspension by particle size, “settling out”” of one or more components, or interaction of light (Tyndall Effect). |  |  |
| I can examine the periodic table to classify matter. | * I will identify where metals, nonmetals, and metalloids are located on the periodic table. * I can look at a chemical formula and identify whether it is an element or a compound. |  |  |
| I can model the phase change process and the relationship among the particles of matter. | * I will illustrate or demonstrate the different relationships of particle attraction in solids, liquids, and gases. * I will illustrate or demonstrate the different relationships of particle motion in solids, liquids, and gases. * I will illustrate or demonstrate the different relationships of gain or loss of heat in solids, liquids, and gases. * I will investigate how pressure affects the movement of particles in a gas. |  |  |
| I can identify various phase changes. | * I will illustrate melting, freezing, vaporization, and condensation. * I will interpret a phase change diagram or graph. |  |  |
| I can compare evaporation and vaporization. | * I will explain the difference between evaporation and vaporization. * I will explain why some substances do not evaporate. * I will explain relationship between surface particle attraction and colliding air molecules. |  |  |
| I can identify the formation of a homogenous mixture as solution | * I will explain why solutions are classified as homogenous mixtures. * I will explain why a formation of a solution is a physical change. |  |  |
| I can explain the parts of a solution and determine the solubility. | * I will identify the solute and solvent of a solution. * I will analyze the cause and effect relationship involving the forces of attraction between a solute and solvent. |  |  |
| I can analyze and interpret a solubility graph. | * I will use a solubility graph to determine the concentration of a solution (saturated, unsaturated, supersaturated). |  |  |
| I can analyze and explain the concentrations of a solution. | * I will identify if a solution is diluted or concentrated and classify the solution as saturated, unsaturated, or supersaturated. |  |  |
| I can investigate how to mathematically calculate the density of different substances. | * I will perform an inquiry lab to determine the density of unknown objects. * I will calculate density using D=m/V. * I will compare the relationship between the mass, volume, and density of different objects. * I will analyze and interpret density graphs. |  |  |
| I can investigate the physical properties of mixtures. | * I will identify through investigation characteristics of a mixture including solubility, density, boiling point, magnetic property, etc. |  |  |
| I can compare the physical and chemical properties of the elements of the periodic table | * I will identify the various physical and chemical properties of metals, nonmetals, and metalloids. * I will identify them by state of matter at a given temperature, density, melting point, boiling point, luster, conductivity, ductility, malleability, color, reactivity, etc. |  |  |
| I can investigate the physical and chemical properties of common everyday materials. | * I will perform a lab activity in which I classify everyday materials such as salt, sugar, baking soda, corn starch, rubbing alcohol, water, etc. |  |  |
| I can identify the parts of an atom. | * I will illustrate the location of protons, electrons, and neutrons. * I will determine the charge and relative mass of protons, electrons, and neutrons. |  |  |
| I can mathematically determine protons, electrons, and neutrons, and mass numbers of atoms and ions. | * I will calculate the number of protons, electrons, neutrons, and mass for a given atom or ion. |  |  |
| I can analyze the existence of isotopes. | * I will relate isotopes and average atomic mass in conceptual circumstances, (such as comparisons to grades and grade averages). * I will identify and write symbols and isotopic notations for various isotopes, (Carbon-12, C-12, 12C. etc.). |  |  |
| I can identify and analyze a Bohr model. | * I will explain the parts of a Bohr model. * I will identify number of electrons on each energy level. * I will interpret various Bohr models of elements. |  |  |
| I can design Bohr models of elements 1 to 18 on the Periodic Table. | * I will illustrate Bohr models from Hydrogen to Argon. * I will illustrate Bohr models of common isotopes and ions. |  |  |
| I can create and model Lewis-dot diagrams. | * I will illustrate dot diagrams of Bohr models, using symbols and dots to identify valence electrons located in the outermost energy levels. |  |  |
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| **Matter: Properties and Change**  **PSc.2.2 Understand chemical bonding and chemical interactions.** | | | |
| **Learning Targets (I can)** | **Criteria for Success (I will)** | **Mastery Level %** | **Date** |
| I can predict valence electrons on the Periodic Table. | * I will identify valence electrons, based on their location in Groups 1, 2, and 13-18. * I will illustrate valence electrons with Lewis-dot diagrams. |  |  |
| I can predict an element’s oxidation number. | * I will identify oxidation numbers, based on their location in Groups 1, 2, and 13-18, including the elements tin and lead (transition metals). |  |  |
| I can generalize periodic trends. | * I will compare reactivity of metals and nonmetals. |  |  |
| I can analyze and predict the different types of chemical bonds. | * I will compare and contrast ionic, covalent, and metallic bonding. * I will illustrate different types of bonds using Lewis-dot diagrams. * I will identify the type of bond shown between elements of a compound. |  |  |
| I can name and write formulas for simple ionic binary compounds. | * I will demonstrate how to name formulas for elements found in Group 1, 2, and 3-18. |  |  |
| I can name and write formulas for simple compounds containing polyatomic ions. | * I will demonstrate how to name formulas for elements containing polyatomic ions found in Group 1, 2, and 3-18. |  |  |
| I can name and write formulas for covalent binary compounds. | * I will apply Greek prefixes (mono, di, tri, tetra, etc.), to properly name covalent compounds. |  |  |
| I can demonstrate how to balance chemical equations. | * I will demonstrate the ability to count elements in a given formula. * I will manipulate coefficients to demonstrate the Law of the Conservation of Matter. |  |  |
| I can classify types of chemical reactions. | * I will identify and illustrate the four types of reactions including, synthesis, decomposition, single replacement, and double replacement. |  |  |
| I can identify combustion reactions. | * I will summarize and explain that water and carbon dioxide are produced when a hydrocarbon is burned in the presence of oxygen. |  |  |
| I can recognize common inorganic acids. | * I will discuss the properties of several inorganic acids, including hydrochloric (muriatic) acid, sulfuric acid, acetic acid, nitric acid and citric acid. |  |  |
| I can recognize common bases. | * I will discuss the properties of several common bases, including sodium bicarbonate, and hydroxides of sodium, potassium, calcium, magnesium, barium and ammonium. |  |  |
| I can define acids and bases based on Arrhenius Theory. | * I will explain the criteria for a compound to be classified as an Arrhenius acid or base. |  |  |
| I can identify and classify substances on the pH scale and their characteristics. | * I will illustrate the pH range and scale. * I will give examples of substance that are acids and bases. * I will compare weak acids and bases with strong acids and bases. * I will discuss the reactivity of acids and bases with metals, carbonates, fats/oils, and conductivity. * I will give examples of acids and bases found in household use. |  |  |
| I can explain a neutralization reaction. | * I will identify the acid, base, and salt in a neutralization reaction. |  |  |
| **Matter: Properties and Changes**  **PSc.2.3 Understand the role of the nucleus in radiation and radioactivity.** | | | |
| **Learning Targets (I can)** | **Criteria for Success (I will)** | **Mastery Level %** | **Date** |
| I can identify alpha particles, beta particles, and gamma rays. | * I will compare composition, mass, penetrability of alpha particles, beta particles, and gamma rays. |  |  |
| I can compare nuclear decay processes. | * I will demonstrate and illustrate alpha decay, beta decay, the release of gamma rays. |  |  |
| I can analyze fission and fusion. | * I will compare and contrast fission and fusion. |  |  |
| I can explain the concept of half-lives. | * I will model half-life. * I will mathematically perform half-life calculations. |  |  |
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| **Energy: Conservation and Transfer**  **PSc.3.1 Understand types of energy, conservation of energy and energy transfer.** | | | |
| **Learning Targets (I can)** | **Criteria for Success (I will)** | **Mastery Level %** | **Date** |
| I can explain how various materials absorb or release thermal energy | * I will interpret graphs to infer how mass, specific heat capacity, and temperatures are related. * I will compare and contrast thermal energy, heat, and temperature. |  |  |
| I can relate phase changes to changes in energy. | * I will explain how potential energy and kinetic energy are related to the phases of matter. * I will graphically interpret that there is not a phase change during latent heat period. |  |  |
| I can explain methods of energy transfer. | * I will explain and diagram real world examples of conduction, convection, and radiation. * I will analyze through investigation how heat is transferred through various materials. |  |  |
| I can demonstrate the law of conservation of energy. | * I will demonstrate how kinetic energy, potential energy, and heat are related through an investigation on mechanical systems (ex: pendulum, roller coaster, cars/balls on ramps, etc.). * I will explain how friction in a system is transformed from mechanical energy to heat energy. |  |  |
| I can mathematically calculate work. | * I will solve word problems identifying W=Fd. * I will be able to identify the correct displacement from a word problem to solve for work. |  |  |
| I can analyze work including force, displacement, and energy transfer. | * I will explain how work requires energy and the relationship between work and energy. * I will be able to identify scenarios where work is being done. |  |  |
| I can explain the relationship between work and power and the relationship with their associated formulas. | * I will solve problems in relation to work and power. * I will explain how work and power are related in solving problems. * I will practice the process of how to calculate work to solve for power. |  |  |
| I can analyze a system to identify simple and complex machines. | * I will categorize simple machines into 2 categories (lever or inclined plane). * I will illustrate examples of simple machines and their parts. * I will identify simple machines in a complex machine. |  |  |
| I can compare and contrast ideal and actual mechanical advantage. | * I will calculate ideal and actual mechanical advantage. (using formulas) * I will explain why no machine has ideal mechanical advantage. |  |  |
| I can determine efficiency and relate it to the law of conservation of energy. | * I will calculate the efficiency of a machine (using the efficiency equation). * I will explain why no machine is 100% efficient. |  |  |
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| **Energy: Conservation and Transfer**  **PSc.3.2 Understand the nature of waves.** | | | |
| **Learning Targets (I can)** | **Criteria for Success (I will)** | **Mastery Level %** | **Date** |
| I can identify the basic characteristics of a longitudinal (compressional) wave. | * I will illustrate and label parts of the longitudinal wave including: amplitude, rarefaction, and compression. * I will demonstrate the characteristics of a longitudinal wave through the slinky lab. |  |  |
| I can analyze the relationship between period and frequency. | * I will explain and demonstrate the concept of the inverse relationship between period and frequency. |  |  |
| I can explain and calculate wave velocity. | * I will explain how velocity, wavelength, and frequency are related. * I will calculate the velocity of a wave (using the wave velocity equation Vw=λf). * I will investigate the energy of waves at various amplitudes. |  |  |
| I can classify types of waves. | * I will compare and contrast the characteristics of the three main types of waves: mechanical, electromagnetic, and surface waves. * I will investigate the effect of wave speed, material used, and motion of particles in the production of different wave types. |  |  |
| I can compare and contrast compressional (longitudinal) and transverse waves. | * I will analyze the two types of waves in terms of particle motion in relation to wave direction. |  |  |
| I can illustrate reflections and refraction of waves. | * I will diagram and identify the reflection of a transverse pulse at the fixed end of a spring rope, sonar and radar, water and surface waves. * I will diagram and identify refraction of water waves as water depth changes, sound and light as they change media. |  |  |
| I can compare and contrast wave interference. | * I will illustrate constructive and destructive interference in waves. * I will demonstrate with real world examples such as sound pulses in spring and ropes, light (soap bubbles/thin films, diffraction grating), and CDs. |  |  |
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| **Energy: Conservation and Transfer**  **PSc.3.3 Understand electricity and magnetism and their relationship.** | | | |
| **Learning Targets (I can)** | **Criteria for Success (I will)** | **Mastery Level %** | **Date** |
| I can identify and compare charging of objects. | * I will demonstrate examples of how opposite charge attract and like charges repel. * I will compare and contrast conduction, friction, and induction. * I will explain how electrons transfer and re-distribute between charged objects. |  |  |
| I can compare and contrast static electricity and current electricity. | * I will analyze the movement of charges through real world examples (ex: balloon on hair vs. currents). |  |  |
| I can identify simple circuit diagrams. | * I will illustrate simple circuit diagrams and use their correct symbols. |  |  |
| I can compare and contrast open and closed circuits. | * I will interpret and demonstrate examples of open and closed circuits. * I will explain the difference between an open and closed circuit. * I will generate metaphors for open and closed circuits. |  |  |
| I can calculate current, potential difference, and resistance of a circuit using Ohms law. | * I will apply Ohms law to calculate circuit diagrams and word problems. |  |  |
| I can compare and contrast series and parallel circuits. | * I will analyze the concept of electricity flow in series and parallel circuits. * I will investigate the difference of series and parallel circuits. * I will investigate how voltage and resistance affects flow of electricity through parallel and series circuits. |  |  |
| I can explain how properties of the conductor affect the circuit. | * I will investigate how current and resistance are related. * I will investigate the affect of length, diameter, and temperature on resistance. * I will discuss how a hallway is a metaphor for a cause and effect model of resistance |  |  |
| I can describe the behaviors and characteristics of magnetic domains. | * I will illustrate or diagram the behavior of magnetic domains. * I will explain the attraction of unlike poles and repulsion of like poles. * I will investigate the properties of a solenoid * I will investigate the relationship between the strength of an electromagnet and the variance in number of coils, voltage, and core material. |  |  |
| I can compare, contrast, and apply the relationship between electricity and magnetism. | * I will investigate the relationship of magnets and electricity to generators and motors. * I will explain how generators and motors convert energy. * I will infer how the relationship of electricity and magnetism are used in real world applications (i.e. security cards, speakers, automatic sprinklers, traffic signal triggers, battery charges, transformers AC-DC adapters). |  |  |

Adapted from: Iredell-Statesville Public School Physical Science Curriculum Guide